

CA20N
EV
1982
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S P O T A N D G R A I N F U M I G A T I O N



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(Q) What is a spot fumigant?

(A) A spot fumigant is a chemical in the liquid state applied to mill machinery at specific application points. Upon exposure to room temperature vapourization occurs.

In the province of Ontario almost all flour mills and many bakeries use ethylene dibromide (EDB) and ethylene dichloride (EDC) mixtures for machinery fumigation. A few products commonly referred to as spot fumigants are designed for grain fumigation or as space fumigants, but, by definition, these are not spot fumigants.

(Q) Which products on the market are grain fumigants and which are spot fumigants?

(A) The table below identifies the two types, and gives their chemical composition.

TABLE #1

Schedule	PCP#	Product Name	Registrant	Content (%)				
				CTC	EDB	EDC	MBR	CAD
<u>GRAIN FUMIGANT</u>								
2	10504	Kemfume 80-20 Grain Fumigant	Kem-San Ltd.	83	-	-	-	16.4
2	2707	Dowfume EB5 Grain Fumigant	Dow Chemical Co.	64	7	29	-	-
2	14364	Kemfume Bin Fumigant	Kem-San Ltd.	83	-	-	-	16.4
2	5042	Tri-X Fumigant	McGoun Chemicals Quebec	65	5	30	-	-
2	12674	Sanifume 5	Sanex Ltd.	64	7	29	-	-
2	11366	FIA 80-20	Stauffer Chemical Co.	83	-	-	-	16.4
1	9169	Dawson Fumigant 37	Ferguson Fumigant	-	30	-	70	-
2	11970	Sanifume Grain Fumigant	Sanex Ltd.	83	-	-	-	16.4
<u>SPOT FUMIGANTS</u>								
2	2324	Dowfume EB15	Dow Chemicals Co.	57	20.4	19.6	-	-
1	9118	Dawson 73	Ferguson Fumigant	-	70	-	30	-
2	14402	Kemfume 59 spot fumigant	Kem-San Ltd.	32	59	9	-	-
2	14403	Kemfume Mill spot fumigant	Kem-San Ltd.	57	20.4	19.6	-	-
2	15249	Sanifume 59	Sanex Ltd.	32	59	9	-	-
2	12405	Sanifume 15	Sanex Ltd.	60	20.4	19.6	-	-

CTC - carbon tetrachloride
MBR - methyl bromide
CAD - carbon disulphide

(Q) Which insects can be controlled by the registered fumigants in Table 1?

Rusty grain beetle	Granary weevil
Lesser grain beetle	Rice weevil
Flat grain beetle	Cadelle
Saw-toothed grain beetle	Indian meal moth
Confused flour beetle	Mediterranean flour moth
Red flour beetle	

Precautions for use and recommended procedures appear on the label and are reinforced by Sections 51, 52 and 57 of the Pesticide Act, 1973 and Regulations of Ontario. All other uses of ethylene dibromide and ethylene dichloride have been removed from registered labels and are thus illegal.

(Q) What is ethylene dibromide?

(a) The formula for ethylene dibromide (EDB) is $\text{CH}_2\text{Br}-\text{CH}_2\text{Br}$, or 1, 2 - dibromoethane. It is a colourless liquid with a specific gravity of 2.17 and a boiling point of 113°C . It is not explosive and is non-flammable. It gives good penetration and is very toxic to grain insects. It imparts no taste or odour to grain. This gas is more dangerous to humans than methyl bromide because of its penetration properties. EDB has an acute oral LD_{50} (rat) of 146mg/kg and an acute vapour toxicity of 200ppm.

(Q) What is ethylene dichloride?

(A) Ethylene dichloride (EDC) or $\text{CH}_2\text{Cl}-\text{CH}_2\text{Cl}$, 1, 2 - dichloroethane, is a flammable chemical in both the liquid and vapour state. Carbon tetrachloride, is, therefore, mixed with it as a fire retardant. EDC is very soluble in fats or oils; thus fumigation of cereals with a high oil content should be avoided. EDC has an acute oral LD_{50} (rat) of 670-890mg/kg and an acute vapour toxicity of 1000ppm.

(Q) How is EB 59 (ethylene dibromide 59%) applied?

(a) EB59 may be applied through pre-bored 6 mm holes by suitable automatic application equipment or with a portable hand-operated applicator calibrated to deliver accurate doses. Containers of aluminum, magnesium or their alloys must not be used as EB59 may corrode them. EB59 can also be applied from 910ml graduated cylinders. Ethylene dibromide/ethylene dichloride mixtures may be corrosive to some plastics. The use of glass is discouraged in mills in case of breakage and resulting contamination. The label gives the advised dosage rates. EB59 should be used at monthly intervals to supplement general fumigations. All equipment is run dry to allow the fumigant to reach all areas of the machinery. All air movement inside the machinery must be eliminated. This product is heavier than air, thus the applicator should work from the lower floors towards the upper levels to reduce exposure.

During application a full face mask and black organic vapour canister must be worn. No jewellery, rubber gloves or rubber boots should be worn.

As stated in the Pesticides Act, 1973, warning signs and locks must be placed on all entrances. Remember that two adult persons must be present on all spot fumigation jobs. The aeration can begin after 12 to 24 hour exposure. A new canister attached to a full face mask must be worn.

(Q) How does one apply EB15? (Ethylene dibromide 20.4%, ethylene dichloride 19.6%).

(A) The mill is run dry, and all sifter stockings are tied off. The pack-out bins are sealed by tying one third of a bag of flour up the tube. The fumigant is applied by pouring the required dose into application points from 910ml graduated plastic cylinders. A full face gas mask with a new black organic vapour canister must be worn. Signs and locks must be used on all entrances. Two persons must be present on all spot fumigation jobs. The 910ml cylinders should be filled in a well ventilated area. Rubber gloves or boots should not be worn nor any jewellery on the wrist or fingers. Due to the relatively high proportion of inflammable ethylene dichloride, the use of carbon tetrachloride in a 3:1 ratio of CTC:EDC is used. Carbon tetrachloride also increases the penetration of the fumigant. EB15 is used to supplement general fumigation, usually on a monthly basis.

After 24 hour exposure (see the label for proper dosage rates) aeration can take place. This will usually take 2 to 4 hours in the average mill. The one-third of a bag of flour should be discarded.

The first run of the mill should be re-blended back into the process.

(Q) What procedures should be followed if a spill or poisoning occurs?

(A) IF EDB/EDC is splashed on the skin or in the eyes they should be thoroughly washed. If the eyes are involved do not rub them. Instead, wash them out for at least 15 minutes and go to a hospital for further treatment.

If EDB/EDC is swallowed, induce vomiting at once. If poisoning is due to inhalation, move the victim to fresh air and call a physician. Remember to take the label along to the Poison Control Centre to aid the physician in choosing the appropriate medication.

(Q) How can the presence of EDB/EDC be detected?

(A) By the use of a Halide Leak detector, thermal conductivity units or gas detector tubes.

(Q) What is Dawson 73?

(A) Dawson 73 is a low dosage spot fumigant used in Flour and Cereal Mills, and is composed of 70% ethylene dibromide (a colourless gas at room temperature) and 30% methyl bromide. These two gases work synergistically for deep penetration.

(Q) Into what schedule does it fall?

(A) It is a schedule 1 product in the Province of Ontario but, due to the fact that it is a spot fumigant, Dawson 73 falls under the provisions of Sections 51, 52 and 57 of The Pesticides Act, 1973.

(Q) Will it kill all insect stages?

(A) Yes, laboratory and fields tests show that it will kill all insect stages, and it affects the fertility of adult insects in less than fatal dosages.

(Q) When should a mill be treated?

(A) Preferably on weekends when shut-down time is available. A period of 24 hours is advisable for spot fumigation and aeration in most cereal mills. A higher dosage and shorter exposure time can be used in other types of mills. A cereal or flour mill should undergo spot fumigation on a monthly basis, or at least six times per year, to maintain preventive control between general fumigations.

(Q) Is Dawson 73 flammable?

(A) No, but since methyl bromide makes up 30% of the mixture no open flames or glowing wires should be allowed in the area because in the presence of a flame, methyl bromide reacts to form hydrobromic acid which can cause damage to materials such as stainless steel. In fact, due to the danger of explosion in running mills it is not likely that open flames will exist.

(Q) Should the miller clear out all the equipment to prepare for a spot fumigation.

(A) This is not necessary, since the fumigant is capable of deep penetration. The machinery should, however, be run dry so that there are no full conveyor screws, bins or spouts to block the fumigant. The cracks and crevices filled with residual stock act as harborage areas for insects. On the other hand, they form a seal for the fumigant so, in fact, maintaining concentration levels.

(Q) Will Dawson 73 penetrate polyethylene tarps?

(A) It can, depending on their thickness. If the pest control operator is involved in other fumigations it would be worth their while to buy 5mm clear tarps. This thickness will last longer and can be reused. In many cases where cyclone dust collectors are present, roof tarping is essential to keep the concentration of the spot fumigant to the desired level.

(Q) Is a gas mask required when using Dawson 73?

(A) Yes. A full face mask with an approved canister (black) or a self-contained breathing apparatus must always be used. These should be of a pattern approved by the U.S. Bureau of Mines and/or the National Institute for Occupational Safety and Health (NIOSH). Check the mask for leaks by pinching the hose and inhaling: if in good order, the mask should create a slight pressure on the face as it collapses. This procedure should be repeated with the canister in place and a hand placed over the hole at the base of the canister. Be certain to check the expiry date stamped on the side of cannister. This is the shelf shelf life and any canister showing a past date should be destroyed. Remember, no canister is suitable if the fumigant concentration is greater than 2% concentration by volume. If the concentration is more than this level a self contained air pack unit must be used.

- (Q) What other protective equipment is required?
- (A) None. No gloves or jewellery should be worn (watches included). Gloves and jewellery will trap the fumigant which will burn the skin underneath. Footwear should consist of leather safety shoes not rubber boots. Remove all cigarettes and wallets from pockets.
- (Q) What measures should one take if a spill occurs with Dawson 73?
- (A) If the fumigant contacts the eyes, wash them thoroughly for 15 minutes (do not rub the eyes) and seek immediate medical attention. Avoid spillage on clothes and skin - flushing with soap and water will assist if a spill occurs.
- (Q) Where does one start servicing in a mill?
- (A) Since Dawson 73 is heavier than air, the treatment should begin at the lower level working to the top floors. The applicator should leave from a fire exit to the outside, locking the door behind himself. This exposes the applicator to the minimum amount of gas.
- (Q) Where in a mill should Dawson 73 be applied?
- (A) Diagram #1 shows the ideal spots for treatment with Dawson 73 and other spot fumigants.
- (Q) How much fumigant should be applied?
- (A) The label instructions will be helpful in deciding how much fumigant to apply. When Dawson 73 is used in a mill a plan of action is necessary. All points of application should be marked out so that special grease cap fittings can be installed. This is performed by drilling 6mm holes in the areas shown in Diagram #1. These snap caps prevent the clotting of these application points with flour dust, and should be marked on small identification stickers. Since it is a heavy vapour all holes should be on top of the equipment. On the average 57ml per hold should be used in large mills. In smaller mills 43ml is sufficient.
- (Q) How can one be sure that 57ml is being delivered?
- (A) This has been made very simple by the use of a small applicator called the Little Squirt. Dosage can be set at 43 - 57ml by adjusting the pressure regulator. Increasing the pressure decreases the dose rate.
- (Q) How does one operate the Little Squirt?
- (A) The operation manual distributed by Ferguson Fumigants explain the correct procedure.
- (Q) How should Dawson 73 be stored?
- (A) It should be kept in a locked storage area separated from herbicides and other insecticides. Storage facilities must be as outlined in the Pesticides Act, 1973, Sections 98, 99 and 100. Dawson 73 should not be stored in a hot room nor transported in a vehicle in which the temperature may rise above 21°C.

- (Q) What is Dawson 37?
- (A) Dawson 37 is a space fumigant composed of 30% ethylene dibromide and 70% methyl bromide. This is not a spot fumigant and should not be confused with Dawson 73.
- (Q) What is EB-5?
- (A) EB-5 is a grain fumigant containing 64% carbon tetrachloride, 29% ethylene dichloride and 7% ethylene dibromide.
- (Q) What factors affect the effectiveness of EB-5?
- (A) Various factors including the size, shape and permeability of the commodity, the temperature, percentage moisture, and the amount and type of dockage in the grain mass.
- (Q) What is the difference between sorption, adsorption, absorption and desorption.
- (A) Sorption is the term used to describe the loss of gas resulting from the attracting and retaining of the gas molecules by any solid materials which are in the fumigated space. Thus the gas in the air space is tied up in the solid material so that it is no longer available to diffuse throughout that space, or to penetrate further into the material being fumigated. Therefore, sorption reduces the fumigant concentration either by adsorption or absorption.

Adsorption is an adhesion of the gas molecule to the external portions of the kernel. Absorption refers to gas molecules that are held loosely within the kernels by capillary action.

Desorption is the return of the gas from materials in the fumigates space into the surrounding air after a fumigation. This is the reverse of sorption.

- (Q) What major factors should one be concerned with when using EB-5?
- (A) Seven major factors should be considered for a successful fumigation. These are as follows:
1. Before applying the fumigant, seal the structure that houses the grain as gas-tight as possible, especially below the surface of the grain.
 2. Level the grain surface and allow a minimum of 15cm between the top of the bin and the grain surface.
 3. Apply the fumigant from outside the structure with two persons present at all times wearing full face masks and new black organic vapour canisters. Rubber gloves and boots, and jewellery must not be worn.
 4. Apply the fumigant with a hand or power sprayer that allows a broad, coarse stream.
 5. Allow the fumigated grain to remain for at least three days (one week may be recommended depending on commodity).
 6. Refer to label instructions for dosage rates and duration.
 7. Fumigate grain only when its temperature is above 21°C to take advantage of the increased volatility of the fumigant and increased activity of the insects at higher temperatures.

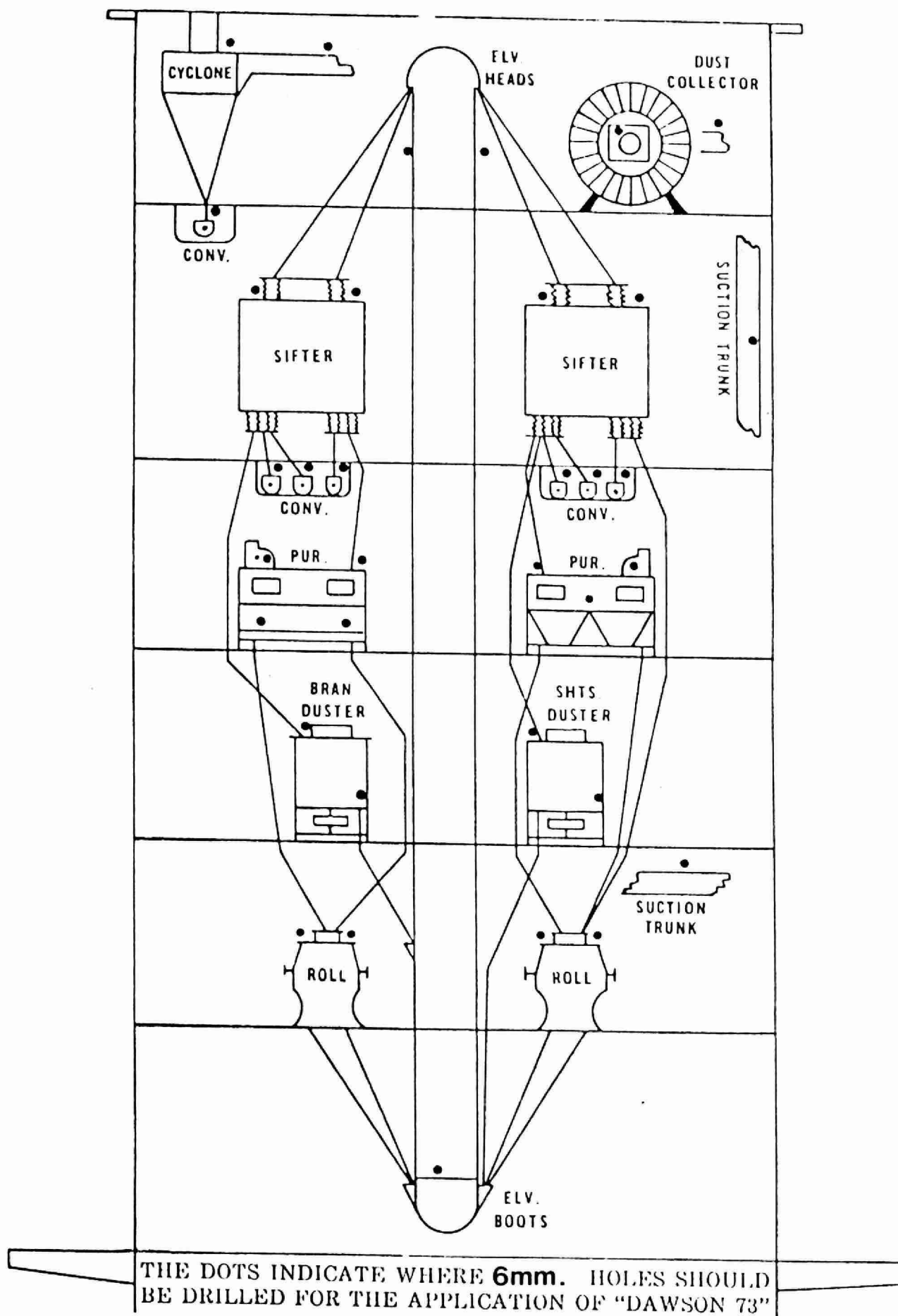


DIAGRAM 1

TECHNICAL DATA FOR CHEMICALS CONTAINED IN SPOT AND GRAIN FUMIGANTS

CHEMICAL NAME	OTHER NAME(S)	FORMULA	COLOUR	ODOUR	BOILING POINT @ 760MM HG	MELTING POINT	VAPOUR PRESSURE	FLAMMABILITY LIMITS IN AIR	LD ₅₀ (RAT) MG/KG	SOLUBILITY IN H ₂ O	SPECIFIC GRAVITY
ethylene dibromide	EDB 1,2-dibromoethane	C ₂ H ₄ Br ₂	clear in liquid state	some	131.6°C	10°C	11.0 mm Hg @ 20°C	none	146 acute oral	0.43g/100ml @ 30°C	2.17 at 20°C in liquid state
ethylene dichloride	EDC 1,2-dichloroethane	C ₂ H ₄ Cl ₂	clear in liquid state	chloroform like odour	83.5°C	-35.3°C	65 mm Hg @ 20°C	some 6.2%-15.9% by volume	670-890 acute oral	0.869g/100 ml @ 20°C	1.25 at 20°C in liquid state
carbon tetra-chloride	CTC tetrachloro-methane or per-chloromethane	CCl ₄	clear in liquid state	some	76.8°C	-22.8°C	91.0 mm Hg @ 20°C	none	5,730 - 9,770 acute oral	0.08g/100ml @ 20°C	1.595 at 20°C in liquid state
carbon disulphide	CAD carbon bisulphide	CS ₂	yellow but clear as a liquid	sweet when pure; impurities have some unpleasant odour	46.3°C	-111°C	297.5 mm Hg @ 20°C	extreme in vapour state 1.25% to 44% by volume	16 acute oral	0.22g/100ml @ 22°C	1.26 at 20°C in liquid state
methyl bromide	MBR	CH ₃ Br	clear in liquid state	none except at high concentrations	3.6°C	-93°C	1,390 mm Hg @ 20°C	none	1mg/l ³	1.75g/100ml @ 20°C	1.732 at 0°C in liquid state

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